International Series GTFX and GVFX Grid-Interactive Inverter/Charger

Programming Manual

About OutBack Power Systems

OutBack Power Systems is a leader in advanced energy conversion technology. Our products include true sine wave inverter/chargers, maximum power point charge controllers, system communication components, as well as breaker panels, breakers, accessories, and assembled systems.

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The International Series GTFX and GVFX Grid-Interactive Inverter/Charger

The International Series GTFX and GVFX Series Inverter/Chargers (also referred to as the FX series) offer a complete power conversion system — DC to AC, battery charging, and an AC transfer switch— which provide complete grid-interactive service. They can also be used in a stand-alone or back-up application. These systems are designed for indoor or enclosed locations.

OutBack Power Systems does everything possible to assure the components you purchase will function properly and safely when installed as instructed according to local and national electrical codes. Please read all of the following instructions and the instructions that come with any other OutBack components that make up your power system. Instructions on setting up individual FX systems, as well as assembly of larger systems, are given in the *International Series GTFX and GVFX Grid-Interactive Inverter/Charger Installation Manual.*

NOTE: This product is not CE compliant for grid-interactive operations.

Grounding Instructions – Each FX should be connected to a grounded, permanent wiring system. For most installations, the negative battery conductor should be bonded to the grounding system at one (and only one) point in the DC system. All installations must comply with all national and local codes and ordinances. System grounding is the responsibility of the system installer.

The equipment ground is marked with this symbol:

The *International Series GTFX and GVFX Grid-Interactive Inverter/Charger Programming Manual* covers safety and the programming or "stacking" of multiple FXs using the OutBack Power Systems MATE.

NOTE:

- An OutBack MATE is required to program the FXs beyond their default values.
- If an OutBack Charge Controller is in use, be sure to read its manual for optimum operation with the FX.
- When powered up, the GTFX/GVFX will automatically sense if a utility grid is present and connect to it after a brief delay. (The duration of this delay varies with AC source and settings.) There is another brief delay before the battery charging starts. The inverter can sell power to the grid after the batteries are charged.

IMPORTANT SAFETY INSTRUCTIONS

General Precautions

1. Use caution whenever working around electricity, electrical components, and batteries. There is always a potential for shocks, burns, injury, and even death if an installer or user comes in contact with electricity.
2. Read all instructions and cautionary markings on the FX, the batteries and all appropriate sections of this manual as well as other component manuals before using the system.
3. Be sure each unit is securely installed according to the instructions in the *International Series GTFX and GVFX Grid-Interactive Inverter/Charger Installation Manual.*
4. Follow all local and national electrical codes when installing OutBack equipment and components.

INTERNATIONAL SERIES INVERTER/CHARGER PROGRAMMING

NOTE: Please see the *International Series GTFX and GVFX Grid-Interactive Inverter/Charger Installation Manual* to install, wire, and connect each FX Series Inverter/Charger. This programming manual assumes all units have been installed and are ready to program according to the way they were wired. To familiarize yourself with the programming concepts, please read through the entire manual before programming your system.

- Stacking FX inverters does not refer to physically placing one FX on top of another. It refers to how they are wired within the system and then programmed for operation. Stacking allows all the inverters to work together as a single system.
- Stacking assigns the inverters to coordinate their power output and to operate at certain times; this priority is assigned using the MATE.

NOTE: An OutBack MATE with a code revision of 3.30 or higher is required to recognize and program grid-interactive FX inverters. When multiple inverters are used, each needs to be assigned a status—master or slave. (A single FX must serve as the master in most cases.)

- The master FX is the primary and most heavily used unit. A slave FX assists during charging or selling, when the master cannot handle all of the power.
- This is an orderly process as long as the user assigns each FX correctly. This is mainly a matter of paying attention to the Port number for each FX when programming with the MATE.

Stacking Concerns

FX inverters should be wired and stacked appropriately to their individual power system. Problems can occur when:

- An FX is incorrectly wired.
- An FX plugged into a HUB Port is mistakenly programmed (assigned the wrong status) or misidentified.

Stacking Options

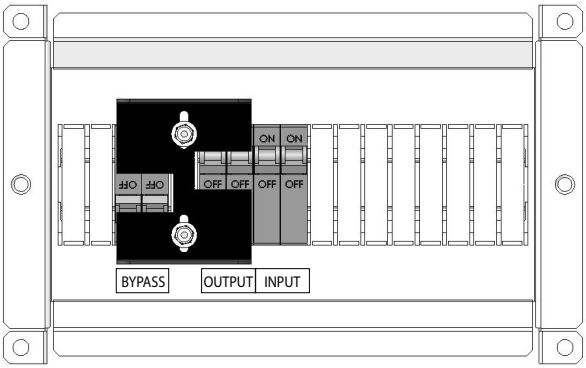
- The GTFX and GVFX Inverter/Chargers can be stacked in "OutBack Parallel" mode, which allows up to 10 inverters to deliver power on a common output bus.
- The GTFX and GVFX Inverter/Chargers can also be stacked in "Three-Phase" mode, to deliver coordinated power to three-phase loads. One inverter is assigned to each phase.
- A HUB-4 or HUB-10 must be included to stack grid-interactive units. The International Series GTFX and GVFX cannot perform "time-of-day" selling.
- If the utility grid fails, the GTFX or GVFX seamlessly transfers the loads to the battery bank. When the utility grid reappears, the inverter system automatically recharges the battery bank in case of future power outages.

NOTE: The OutBack FW-X240 Auto Transformer cannot be used for stacking with an International Series Grid-Interactive FX system.

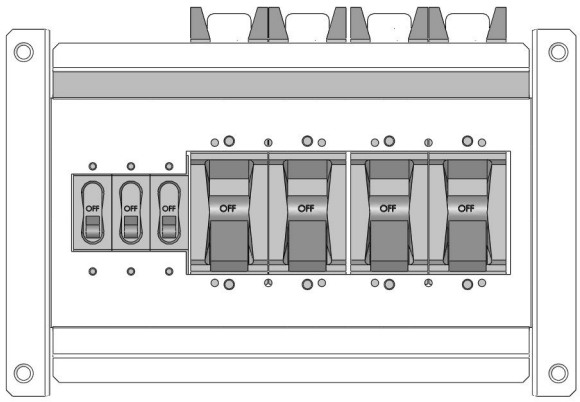
- The following pages describe the physical connections and other steps required before stacking or programming the inverters. The stacking and programming instructions begin on page 9.

COMPONENTS AND CONNECTIONS:

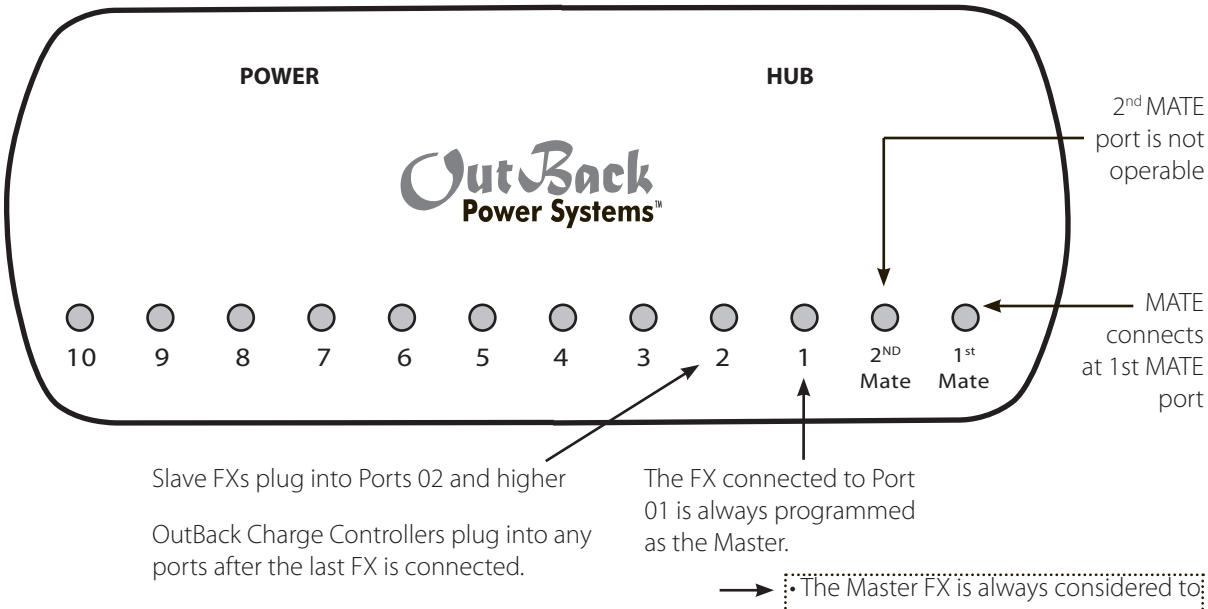
1. With all AC and DC breakers OFF, connect all FXs to the HUB with individual lengths of CAT 5 cable.



AC Breakers Off



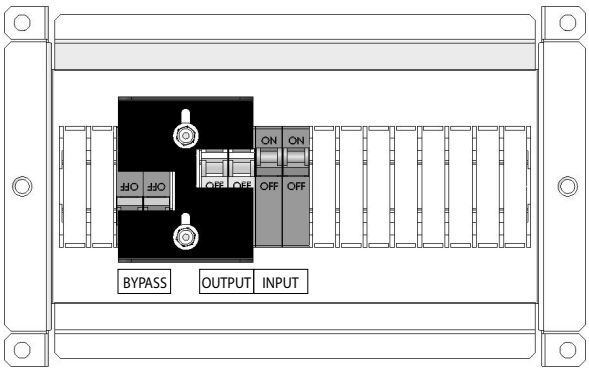
DC Breakers Off



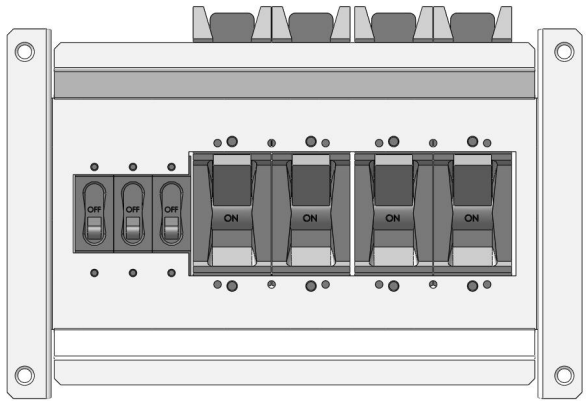
a) Connect the OutBack MATE after all other components, including any OutBack Charge Controllers, have been connected and powered up.
b) If components are installed after powering up the system, it is necessary to repoll the MATE (please see page 6).
c) With the MATE, a user assigns a status and stacking value to the FX on each Port. These status and value assignments can be changed at any time as long as the Master FX is plugged into HUB Port 01.

NOTE: Pay attention to the Port number on the screen! Be sure the FX whose status and stacking value you're changing is the one you mean to change.

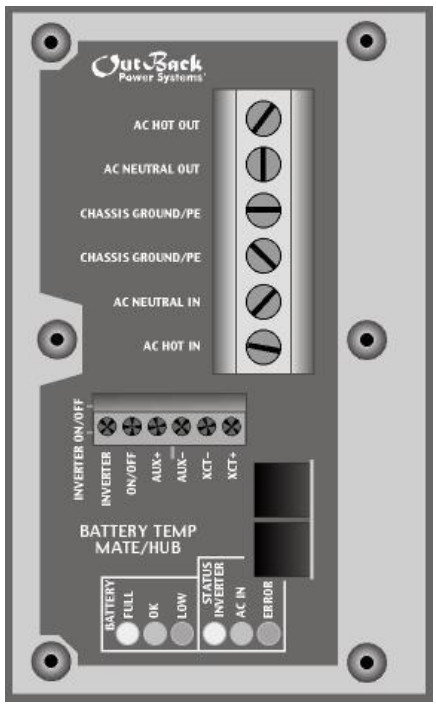
2. With the FXs connected to the HUB, turn only the DC breakers ON and power up the components. All AC breakers should be OFF.



AC Breakers Off



DC Breakers On



LED Color	LED Action	LED Indicates
Green	Solid GREEN →	Inverter ON
	Flashing GREEN ➤	Search Mode or Slave Power
	Off →	Inverter OFF
Yellow	Solid YELLOW →	AC Source is Connected
	Flashing YELLOW ➤	AC Input Live & Waiting to Connect to the FX
	Off →	No AC Input Present
Red	Solid RED →	Error: Shutdown due to fault.
	Flashing RED →	Warning: Noncritical fault.
		The MATE has information on Errors and Warnings.

NOTE: Powering up the FX can cause the red ERROR STATUS light to blink. After 5-10 seconds, the green INVERTER light should be bright and the ERROR and AC IN lights dark. The FX is now producing AC output voltage.

3. After powering up the components, connect the MATE to the HUB.

a) Plug the MATE into the 1st MATE Port on the HUB.

b) The MATE will power up and should recognize any component connected to the HUB.

c) The MATE can then program the inverters.

d) The fifth MATE screen ("Port Assignment") should display all the FX inverters and any OutBack Charge Controllers in the system.

MATE Screens

PATH	→	→	→	→
G'day Mate	(C) 2008 OutBack Power Systems	Version Code a.aa Serial #xxxxxxxx Screen EE b.bb	Searching for Devices HUB Found	Port Assignment 1> FX 2> FX 3> CC 4> CC 5> 6> 7> 8> 9> 10> 2M>

4. To verify that the MATE recognizes each HUB-connected FX and OutBack Charge Controller, disconnect and then either (a) reconnect the MATE to view its boot-up and repoll sequence or (b) follow this path to manually repoll:

PATH	→	→	→	
MAIN----------	SETUP----------	SETUP/MATE/PAGE1	SETUP/MATE/PAGE2	SETUP/MATE/COMM
12.15:30p		mate code rev: 4.1.6	choose category:	choose category:
	choose device:	choose category:		
SUM STATUS SETUP ADV	FX MATE	CLOCK CNT GLOW PG2	PG1 SUMRY COMM MAIN	BACK REPOLL PC DEBUG

The inverters are now ready to be programmed according to the stacking options described in the next section.

STACKING OPTIONS

International Series Grid-Interactive inverters can be stacked in OutBack Parallel or Three-Phase only.

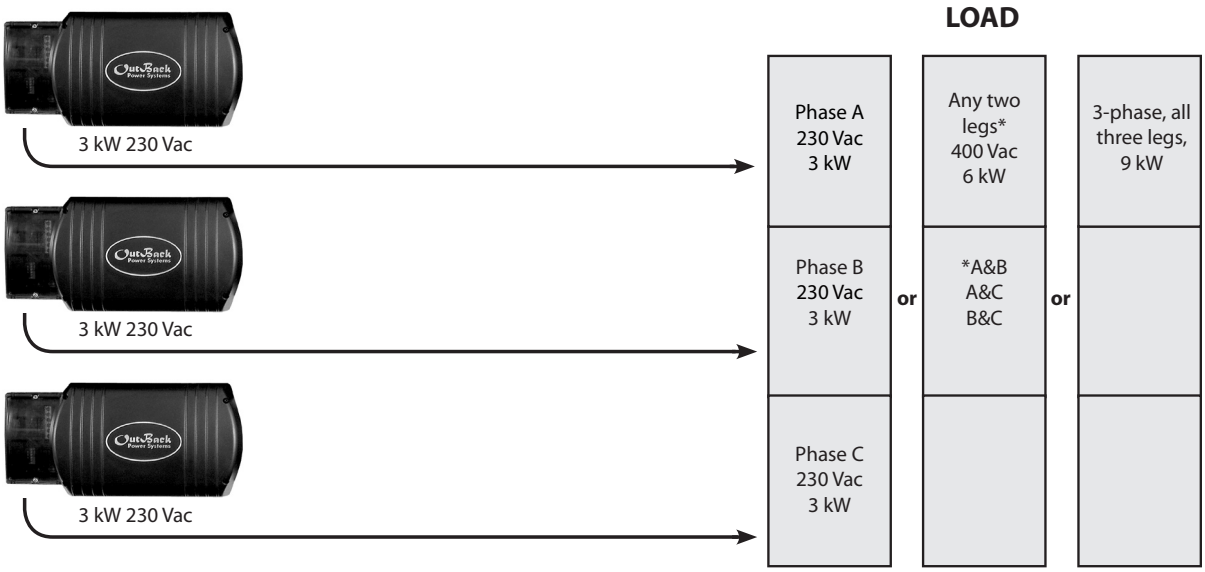
OutBack Parallel

- FX inverters (2 to 10) are wired to the same 230 Vac output leg or phase.
- The Slave FXs can be programmed to remain at different power levels ("Silent" or "On" depending on the need) to save energy; the Slaves will come on when the power demand requires them.
- This power-saving system is fully automatic and works with or without a MATE connected to the system, although a MATE is required to program the components. Without a MATE, the user cannot reprogram.
- The AC input (generator or grid) must be a 230 Vac single-phase source.

Note: Although stacking 10 inverters is possible, OutBack's AC hardware only accommodates configurations of 2, 4, or 8 units. A system with 8 FX inverters would require 2 OutBack AC Input/Output Bypass (IOB) Assembly Kits or installing an external manual bypass; 10 inverters would require 3 IOB kits or an external manual bypass.

THREE-PHASE

- Three FX inverters are connected to three 230 Vac output legs that produce 400 Vac between any two legs of the system.
- The AC input source (generator or grid) must be a 230 Vac/400 Vac three-phase source.



STACKING AND ASSIGNING FX STATUS

Use the MATE to establish the order or hierarchy of all the system inverters by designating each one of the following (in order as they appear on the MATE):

- Master (parallel stacking or three-phase stacking)
- OB Slave L1 (parallel stacking)
- 3p Classic B (three-phase stacking)
- 3p Classic C (three-phase stacking)

Other options will be displayed, but they are not supported on this FX model.

Master

- This is the default ranking of every FX.
- One master FX is established for every multiple-FX system. It applies to all systems, whether single-phase or three-phase. The master unit must be connected to port 01 on the HUB.
- Each Grid-Interactive FX can be a master as long as each is connected to a separate battery and a separate AC output leg (both HOT and NEUTRAL).

OB Slave L1

- OB (OutBack) Slave L1 is the designation of any slave FX in a multi-inverter, single-phase parallel system. It produces 230 Vac to the same AC bus as the master.
- A slave FX is plugged into Port 02, Port 03, or any subsequent port available on the HUB.

3p Classic B

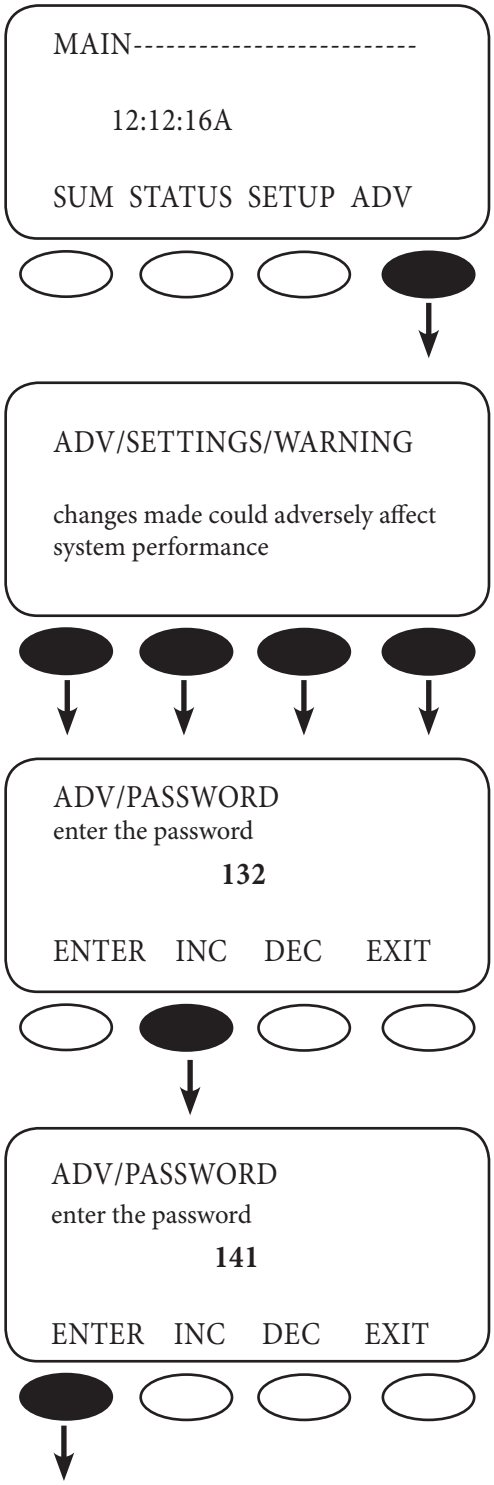
- In three-phase stacking, the unit which is plugged into HUB Port 02 (phase B) is designated as 3p Classic B.

3p Classic C

- In three-phase stacking, the unit which is plugged into HUB Port 03 (phase C) is designated as 3p Classic C.

PROGRAMMING THE FX

Once the MATE recognizes each FX (and OutBack Charge Controller), push and hold the first two soft keys simultaneously to return to the MAIN menu. To program each FX, go to the ADV/FX/STACK menu on the MATE navigating with the following steps:



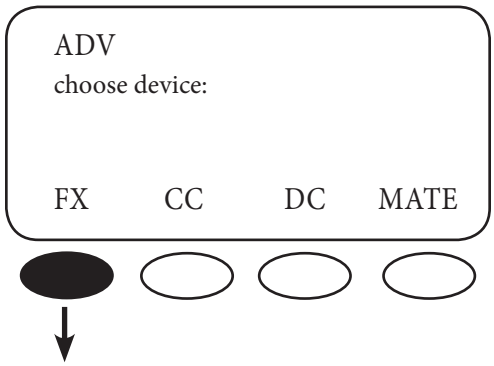
- Press the **<ADV>** soft key.

NOTE: Pressing and holding the first two soft keys at the same time will always bring up the Main Menu screen.

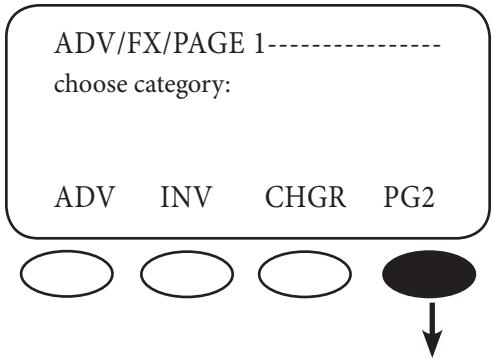
- Push any soft key on the ADV/SETTINGS/WARNING screen and go to the ADV/PASSWORD screen.

- The screen displays <132>. Press the **<INC>** button until it scrolls to the password 141.

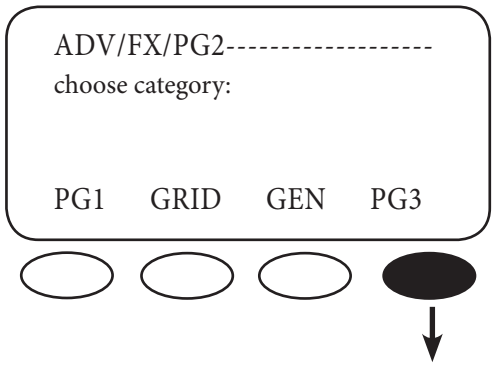
- Push the **<ENTER>** soft key.



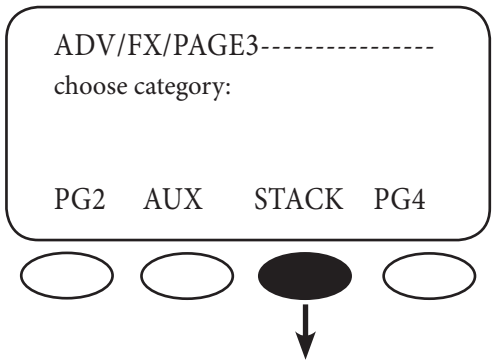
- In the ADV menu, press the **<FX>** soft key.



- On the ADV/FX/PAGE 1 screen, press the **<PG2>** soft key and go to the ADV/FX/PAGE2 screen.

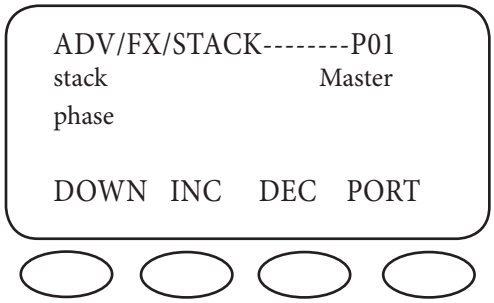


- Press the **<PG3>** soft key which leads to the ADV/FX/PAGE3 screen.

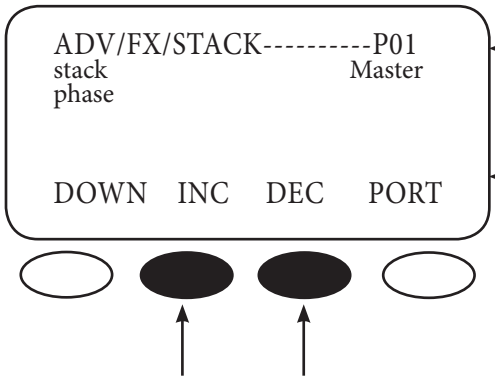


- On the ADV/FX/PAGE3 screen, press the **<STACK>** soft key.

MASTER AND SLAVE



- Stacking the FX Inverter/Chargers begins on this screen.



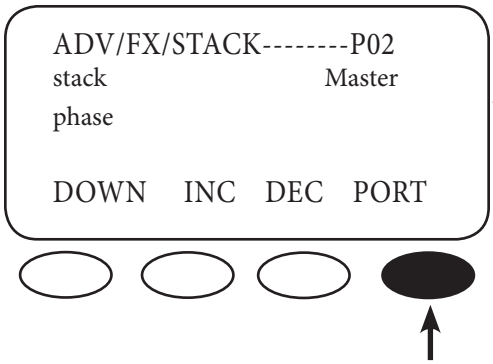
- The master FX is always assigned to Port 01.
- Pressing the **<PORT>** soft key changes the HUB Port whose value you wish to adjust.

Pressing the **<INC>** or **<DEC>** soft keys changes the stacking phase.

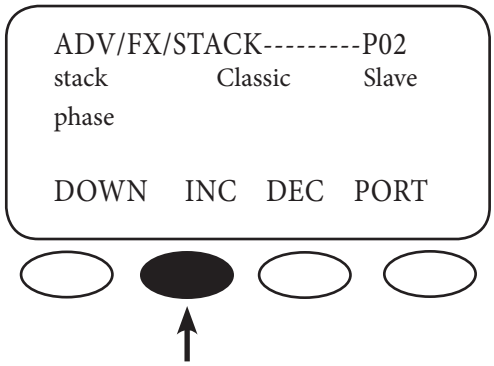
OB SLAVE L1

With the Port 01 FX as the master, press the **<PORT>** soft key to change the remaining Ports and designate the remaining inverters as slaves. To designate them as OB SLAVE L1 for a paralleled system, follow the instructions below. To program them as slaves in a three-phase system, proceed to the next page.

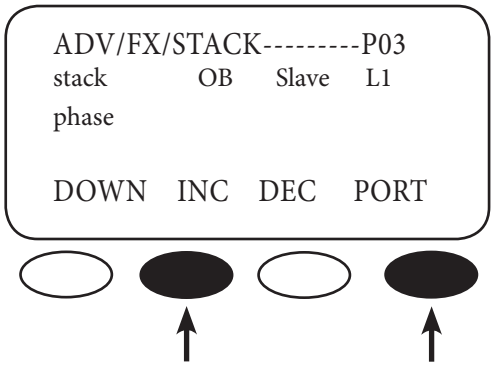
The MATE screen for Port 02 will look like this:



- Press the **<PORT>** soft key to select the second inverter on the HUB.
- In the example to the left, the MATE is now ready to program the FX plugged into Port 02 of the HUB.
- **Please note that Master is the factory default value for the FX inverter. Each non-master FX inverter must be programmed accordingly.**



- Press the **<INC>** soft key. This will advance the display to the Classic Slave screen. **Please note that the International Series GTFX and GVFX cannot utilize Classic Slave mode.** Press the **<INC>** soft key again until the display reads OB Slave L1.

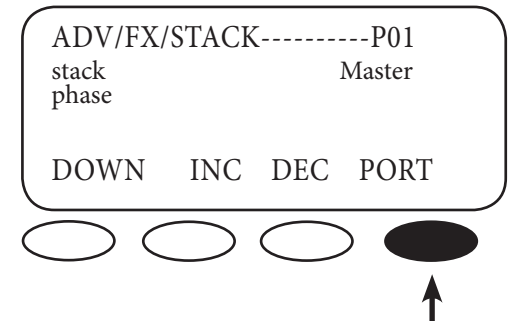


- If you have more than two inverters, push the **<PORT>** soft key to advance to the inverter on P03 (or the next port on the HUB). Once you have selected the next inverter, press the **<INC>** soft key to advance the display to OB Slave L1.

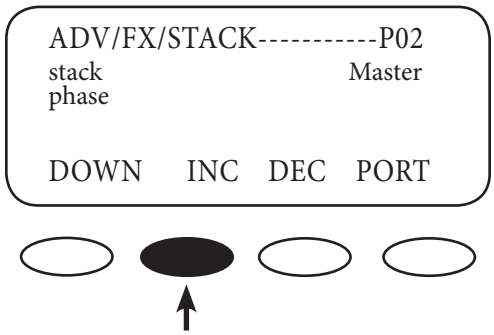
NOTE: There are no **<OK>** or **<DONE**> commands in the stacking menu. Whichever value—Master or Slave — shows up on the MATE screen will be assigned to the chosen Port (and FX) upon leaving that screen. It's important to watch the Port number in the top right corner of each screen to be sure you've assigned it the desired status.

THREE-PHASE SLAVE

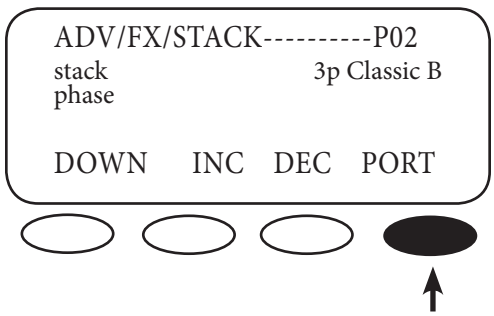
- Make sure the two slave inverters are connected to Ports 02 and 03 of the HUB. The inverter on HUB Port 2 is considered phase B. The inverter on HUB Port 3 is considered phase C.



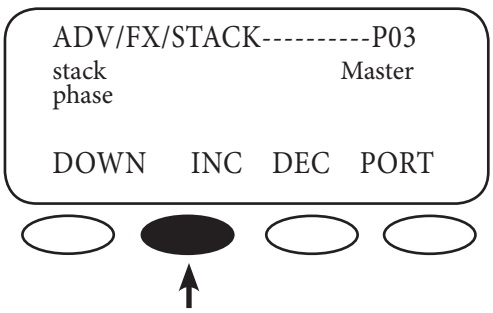
- From the Master screen, press the **<PORT>** soft key until P02 appears.



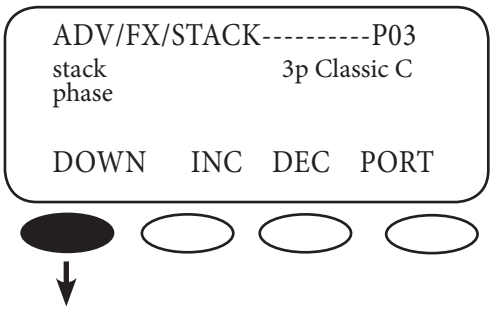
- Each new Port screen in the stacking menu will open with Master displayed. To change the stacking designation, press the **<INC>** soft key until 3p Classic B appears.



- After establishing P02 as a 3p Classic B, press the **<PORT>** soft key to switch to P03.



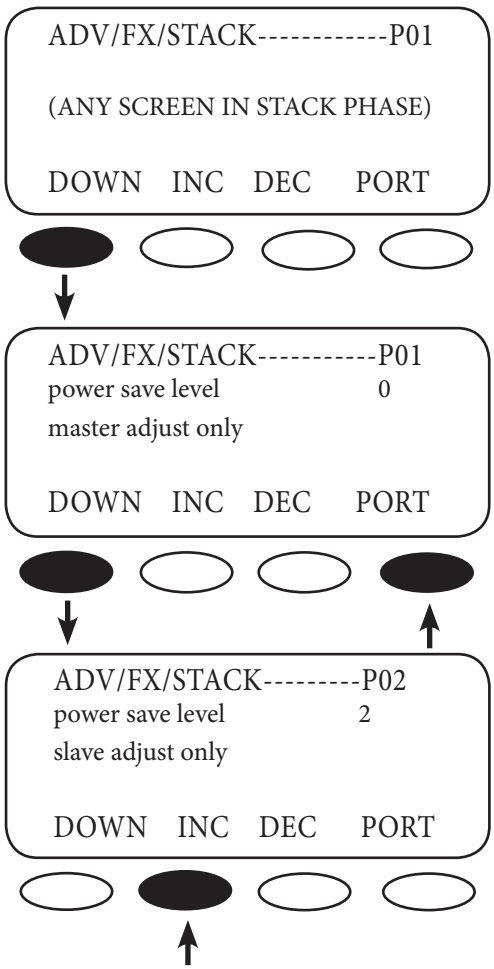
- As before, P03 will open with Master displayed. Press the **<INC>** soft key until 3p Classic C appears.



- Press the **<DOWN>** soft key when finished. This will allow you to observe the power save levels, or exit the menu.

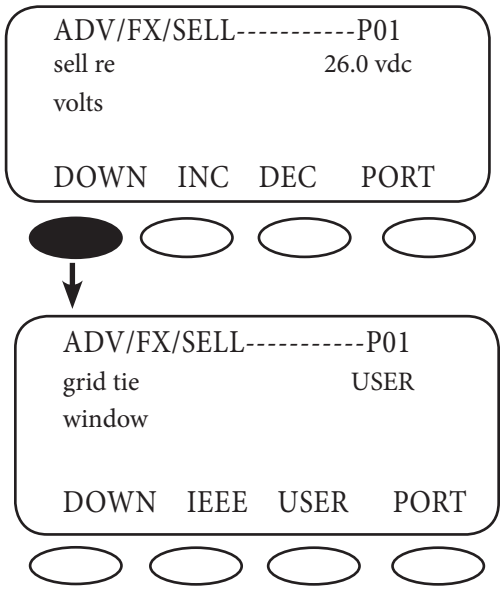
POWER SAVE LEVELS

In grid-interactive models, the power save levels affect the selling and charging functions. The master inverter is set at the lowest power save level, which means it always acts first. The slaves should be set at higher levels, causing them to assist the master as necessary when selling power or charging.



- Press the **<DOWN>** soft key once to view the power save level master adjust only screen.
- The master setting is defaulted at 0. This should not be changed. Press the **<DOWN>** soft key to view the power save level slave adjust only screen. Next, press the **<PORT>** soft key to view the slave inverter, P02 (and other ports if present).
- Press the **<INC>** soft key to change the power save level for the slave inverters. P02 should be set to level 1. If P03 is present, repeat these steps and set it to 2. Other ports should be set at progressively higher levels. (If you have different priorities for the inverters' behavior, other settings are possible.)

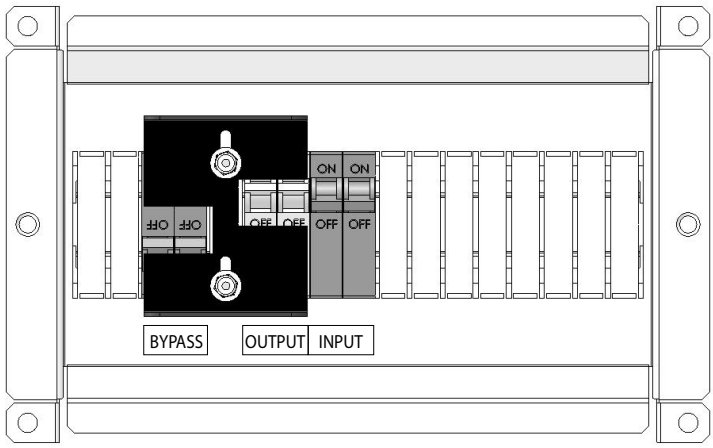
SELL SETTINGS



Two settings in the SELL menu are significant.

- "sell re volts" stands for the voltage level at which the inverter/charger sells renewable energy (RE) back to the grid. This setting is recommended to be lower than the settings for your renewable energy source, but high enough to maintain the battery sufficiently.
- "grid tie window" sets the acceptable frequency and voltage for selling to the grid. (The FX stops selling if the grid exceeds these ranges.) The USER option has a settable voltage range, to accommodate grid quality. The IEEE option has a fixed range of voltage.
- Both options have a fixed frequency window, though the IEEE option is narrower (49-51 Hz) than the User option (48-52 Hz).

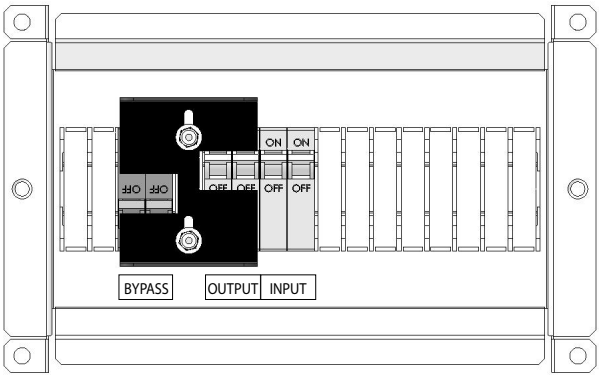
TURNING AC ON



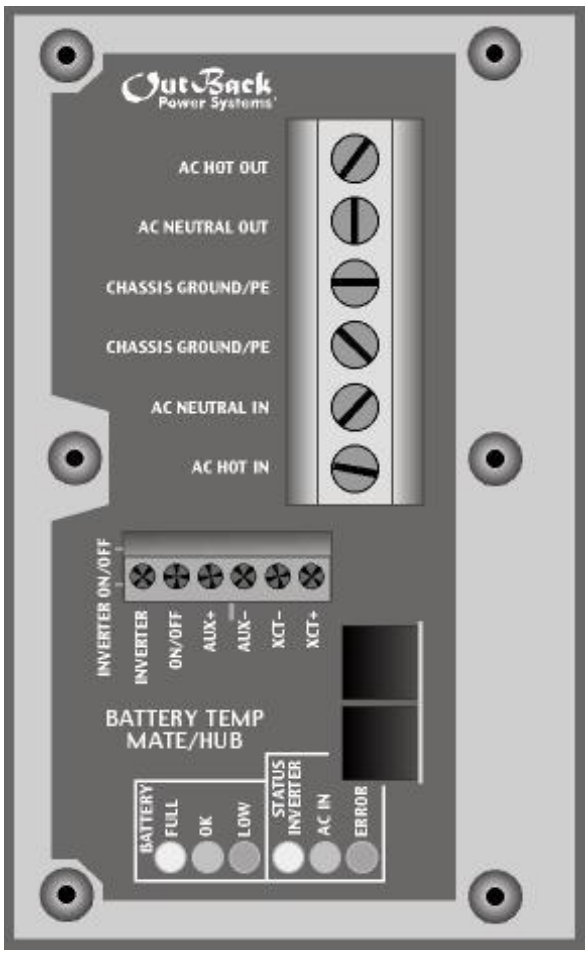
- With the programming completed, turn the AC output breakers ON with the AC BYPASS on the AC breaker panel switched to NORMAL.

Verify the AC voltage output through the MATE following path:

PATH	→	→	→	
MAIN------- 12.15:30p SUM STATUS SETUP ADV	STATUS---------- choose device: FX CC DC MAIN	STATUS/FX/PAGE1---------- choose category: MODES METER BATT PG2	Invert Bulk P00 inv 0.0kw zer 0.0kw chg 0.0kw buy 0.0kw DOWN STATUS PORT	STATUS/FX/METER--P00 output 230 vac voltage DOWN UP TOP PORT



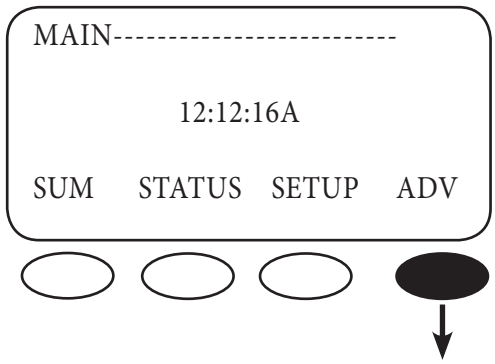
- Turn the AC input breakers ON.



If the FX's AC source is available, the yellow AC IN STATUS light will blink. The FX will connect to the utility grid when the voltage is within 140-280 Vac and the frequency between 44-56 Hz. After a brief delay (which varies with AC source and settings), the AC IN light should stop blinking and stay lit.

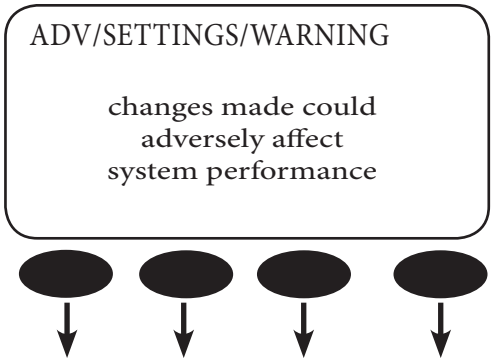
AUXILIARY (AUX) FUNCTIONS

The AUX output provides a 12 Vdc, 0.7 Adc max output at the AUX terminals to control DC loads, or AC external loads, if a DC-controlled relay is used. Typical loads include sending a fault alarm signal or running a small fan to cool the FX.

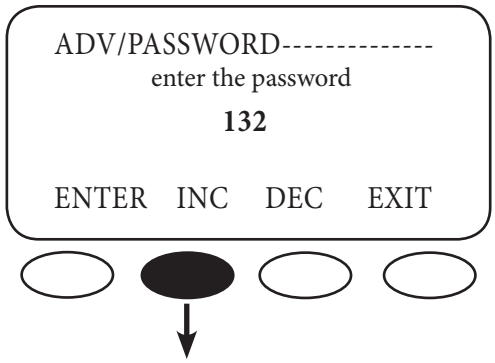


- From the Main screen, press the **<ADV>** soft key.

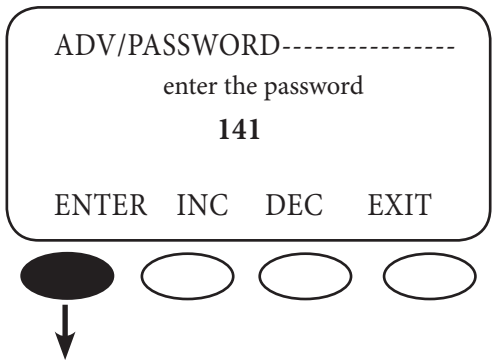
NOTE: Pressing and holding the two left-hand soft keys at the same time will always bring up the Main screen.



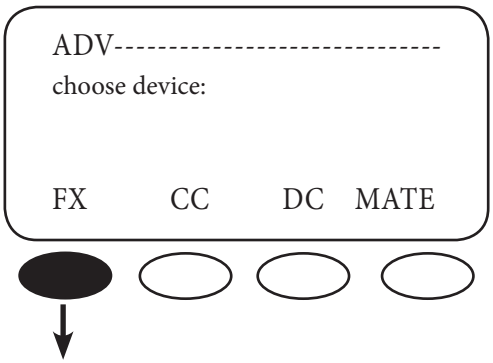
- Push any soft key on the ADV/SETTINGS/WARNING screen and go to the ADV/PASSWORD screen.



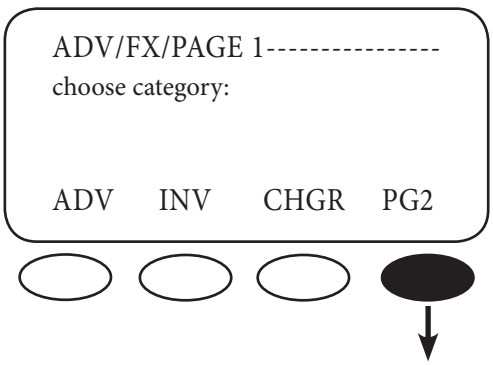
- The screen displays <132>. Press the **<INC>** button until it scrolls to the password 141.



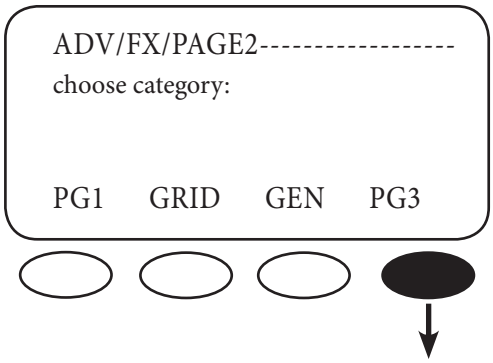
- Push the **<ENTER>** soft key.



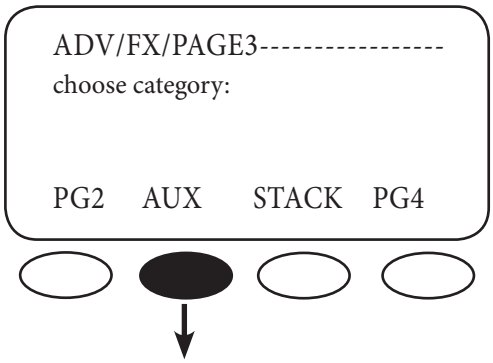
- In the ADV menu, press the **<FX>** soft key.



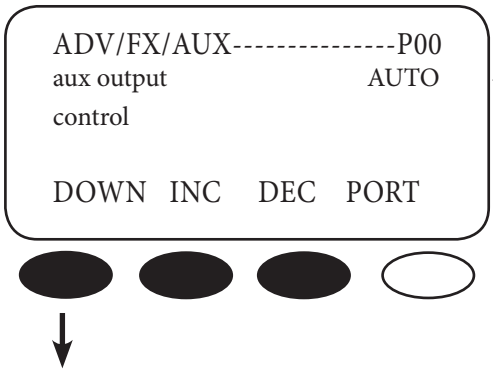
- On the ADV/FX/PAGE 1 screen, press the **<PG2>** soft key and go to the ADV/FX/PAGE2 screen.



- Press the **<PG3>** soft key which leads to the ADV/FX/PAGE3 screen.

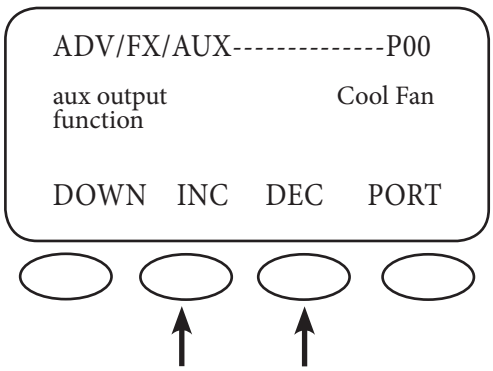


- On the ADV/FX/PAGE3 screen, press the **<AUX>** soft key to adjust the AUX output set points and operation.



Selecting the <INC> or <DEC> soft keys changes the mode of the AUX.

- AUTO allows the AUX to perform a selected AUX OUTPUT FUNCTION, determined in the following screens.
- OFF disables the AUX.
- ON activates the AUX regardless of the selected function.
- Press the **<DOWN>** soft key to select on an AUX OUTPUT FUNCTION.



Pressing the **<INC>** or **<DEC>** soft keys changes the aux output function.

There are nine AUX OUTPUT FUNCTIONS:

- Remote
- Load Shed
- GenAlert
- Fault
- Vent Fan
- Cool Fan
- Divert DC
- Divert AC
- AC Drop

Pressing either the **<INC>** or **<DEC>** soft key will bring up another AUX OUTPUT FUNCTION.

LIST OF AUX FUNCTIONS

- **Cool Fan** activates the standard TurboFan which cools the FX.
- **Divert DC** and **Divert AC** allows the AUX to divert excess renewable energy to a DC or AC load, respectively. This allows control of energy sources such as wind turbines or hydro-generators. When using Divert AC, the AUX output will shut off if the inverter is overloaded.
- **AC Drop** is activated when an AC power source disconnects from an FX. An indicator, such as an alarm, connected to the AUX warns a user that AC power is no longer available.
- **Vent Fan** provides 0.7 amps to run a 12 Vdc fan for removing hydrogen from the battery compartment. Vent Fan can operate automatically when the VENTFAN ON voltage set point is exceeded or it can operate intermittently by adjusting the VENTFAN OFF PERIOD.
- In **Fault** mode, the AUX can send an alarm signal via radio, pager, or telephone device when the FX enters into an error condition. Fault mode can also be used to log error conditions by triggering an event recording device.
- **GenAlert**, through a 12 Vdc relay, will tell the system to start a two-wire type generator when the battery voltage falls below a certain set point. GenAlert can be adjusted according to the shortfallbattery voltage, the amount of time spent at this voltage, the recharged voltage and amount of time at this voltage before GenAlert is de-energized.
- **Load Shed** energizes the AUX to reduce the load demand on the batteries and the inverter function, thus acting as a load management system.
- Setting the AUX to **Remote** allows a message sent through the serial port on the MATE to switch the AUX on and off.

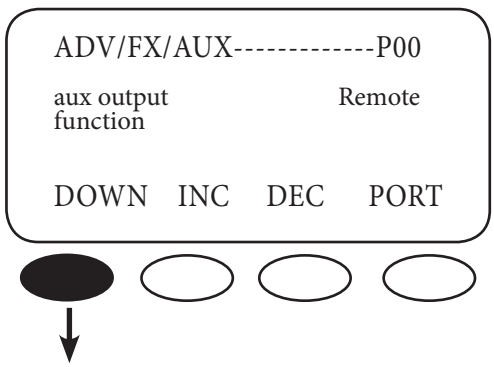
NOTE: Using Advanced Generator Start (AGS) overrides any programmed AUX function.

ADJUSTABLE AUX OUTPUT FUNCTIONS

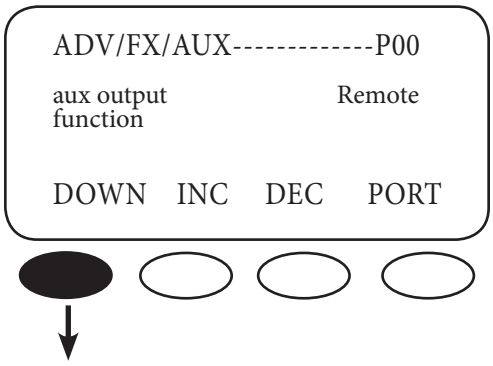
Four of the AUX functions shown above have settings which can be adjusted by the user:

- Diversion
- Vent Fan
- GenAlert
- Load Shed

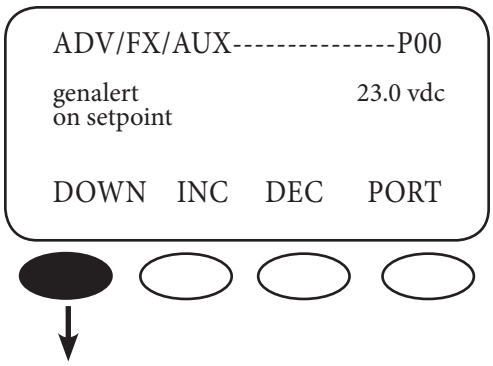
NOTE: All voltage settings are given for a 24-volt inverter.



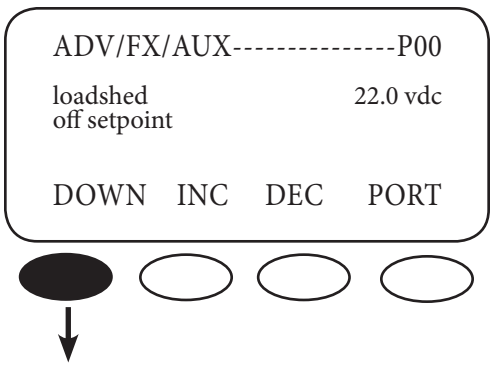
- From the Remote *aux output function* screen, press the **<DOWN>** soft key.



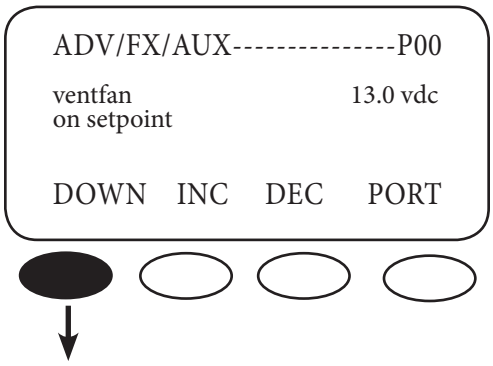
- From the Remote *aux output function* screen, press the **<DOWN>** soft key. This will bring up the first of several screens used to adjust whichever mode you have chosen for the AUX function.



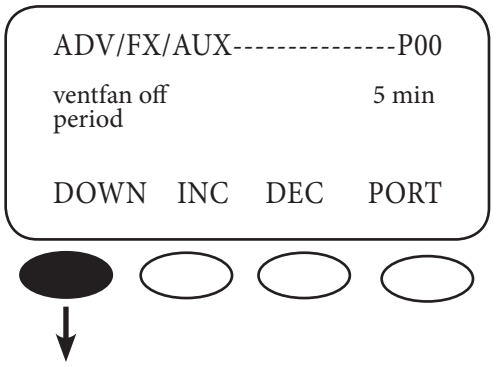
- The ***genalert on setpoint*** functions are not typically used with grid-interactive FXs. Press the **<DOWN>** soft key three times to view the ***loadshed off setpoint*** screen.



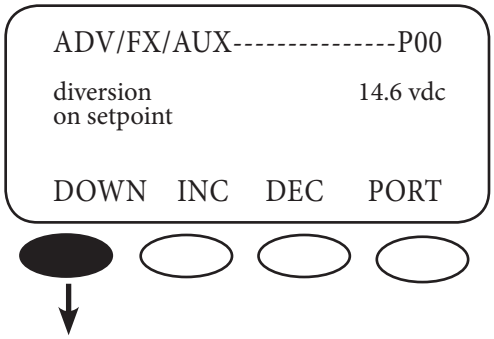
- The ***loadshed off setpoint*** is the battery voltage which triggers the AUX to reduce the inverter and battery loads. When the battery voltage drops below this value for three seconds, the AUX powers a DC coil relay to disconnect an AC load. Once triggered, loadshed remains on for at least three minutes. The ***loadshed off setpoint*** is adjustable from 20 Vdc to 28 Vdc in 0.1 Vdc increments using the **<INC>** and **<DEC>** soft keys. Press the **<DOWN>** soft key to bring up the *ventfan on* setpoint.



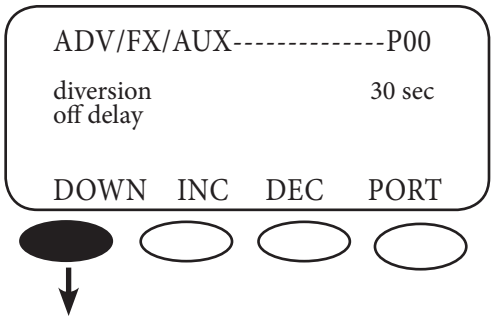
- When the AUX triggers the ventfan function, a fan can be made to ventilate a battery enclosure. (Recharging causes batteries to emit mostly hydrogen gas; higher recharging voltages cause more gas.) The ***ventfan on setpoint*** establishes the battery voltage which energizes the AUX and thus the fan for a one minute period. The voltage setting has a range of 20.0 Vdc to 32.0 Vdc in 0.1 Vdc increments using the **<INC>** and **<DEC>** soft keys. Press the **<DOWN>** soft key to view the ***ventfan off period*** screen.



- If a ventilation fan is only needed intermittently, the ***ventfan off period*** shuts the fan off for a user-determined time before starting up again for a one-minute period when the battery voltage exceeds the ventfan on setpoint. This off period can be set from 0-30 minutes in one-minute increments using the **<INC>** and **<DEC>** soft keys. Setting this period to zero will keep the fan running the entire time the battery voltage is high enough to activate the ventfan function. Setting it to five minutes means the fan will run for one minute and then shut off for five minutes until the battery voltage drops and the fan is no longer needed. Press the **<DOWN>** soft key to view the ***diversion on setpoint*** screen.



- After deciding on Divert DC or Divert AC (see page 19), use the *diversion on setpoint* screen to choose the voltage which will activate this aux function. This value can range from 24.0 Vdc to 32.0 Vdc and can be adjusted in 0.1 Vdc increments using the **<INC>** and **<DEC>** soft keys. Press the **<DOWN>** soft key to view the ***diversion off delay*** screen.



- The ***diversion off delay*** determines how long the AUX will be energized after the battery voltage which caused the diversion falls below the ***diversion on setpoint.*** This delay can range from 0-240 seconds in 1-second increments as adjusted with the **<INC>** and **<DEC>** soft keys.

BATTERY CHARGING INSTRUCTIONS

Keeping your battery bank energized is very important. Although a battery bank can last for many years if properly cared for, it can also be ruined in a short period of time if neglected.

Battery Charging Setpoints

To preserve your batteries *always follow your battery manufacturer's recommendations using the following information:*

- Absorb Voltage
- Float Voltage
- Equalize Voltage
- Recommended Depth-of-Discharge (DOD) of the batteries

These Absorb, Float, and Equalize voltage set points should be programmed into the FX through the MATE (see MATE User Manual).

MAINTENANCE

Please contact OutBack Power Systems Technical Support for any FX repairs due to malfunctions or damage. For routine, user-approved maintenance, please remember these points:

- Disconnect all circuit breakers and related electrical connections before doing any cleaning or adjustments.
- Solar modules may produce hazardous voltages when exposed to light; cover them with opaque material before servicing any connected equipment.
- If a remote generator start system is used, disable the automatic starting circuit while servicing it to prevent the generator from starting while servicing.

FX Default Values (subject to change with FX upgrades)

12 Vdc System	DEFAULT	MINIMUM	MAXIMUM
Charger			
Float Voltage	13.6 Vdc	12 Vdc	15 Vdc
Absorb Voltage	14.4 Vdc	13 Vdc	16 Vdc
EQ Voltage	14.6 Vdc	14 Vdc	17 Vdc
ReFloat	12.5 Vdc	12 Vdc	13 Vdc
LBCO	10.5 Vdc	9 Vdc	12 Vdc
LBCI	12.5 Vdc	10 Vdc	14 Vdc
Absorb Time	1.0 hours	0.0 hours	24.0 hours
EQ Time	1.0 hours	0.0 hours	24.0 hours
Float Time	1.0 hours	0.0 hours	24.0 hours
Charger OFF/AUTO/ON	AUTO	N/A	N/A
Sell RE	13 Vdc	10 Vdc	15 Vdc
GenAlert & AUX			
GenAlert Off Set Point	14 Vdc	12 Vdc	18 Vdc
GenAlert On Set Point	11 Vdc	10 Vdc	14 Vdc
GenAlert On Delay	4 min	0 min	240 min
GenAlert Off Delay	9 min	0 min	240 min
AUX Output Option	COOL FAN	N/A	N/A
Set AUX Control	AUTO	N/A	N/A
Vent Fan Off Delay	5 min	0 min	30 min
Load Shed Off Set Point	11 Vdc	10 Vdc	14 Vdc
Vent Fan On Set Point	13 Vdc	10 Vdc	16 Vdc
Diversion On Set Point	14.6 Vdc	12 Vdc	16 Vdc
AC Output			
Set Vac	230 Vac	210 Vac	250 Vac
AC Transfer			
AC1/Grid Transfer Delay	6 AC cycles	0 AC cycles	240 AC cycles
Grid Lower Limit	208 Vac	140 Vac	220 Vac
Grid Upper Limit	252 Vac	250 Vac	280 Vac
AC2/Gen Transfer Delay	6 AC cycles	0 AC cycles	240 AC cycles
Gen Lower Limit	208 Vac	140 Vac	220 Vac
Gen Upper Limit	252 Vac	250 Vac	280 Vac
Stacking & Search			
Stacking Phase	Master	N/A	N/A
Search Threshold	6 watts	0 watts	50 watts
Search Pulses	8	4	20
Search Pulse Spacing	60 AC cycles	4 AC cycles	120 AC cycles
Charge Rates & Input			
Vented Model Charge Rate	7 Aac	0 Aac	8 Aac
Sealed Model Charge Rate	6 Aac	0 Aac	7 Aac
Grid Input Limit	30 Aac	2.5 Aac	30 Aac
Gen Input Limit	30 Aac	2.5 Aac	30 Aac
Input Select	Grid	N/A	N/A

24 Vdc System	DEFAULT	MINIMUM	MAXIMUM
Charger			
Float Voltage	27.2 Vdc	24 Vdc	30 Vdc
Absorb Voltage	28.8 Vdc	26 Vdc	32 Vdc
EQ Voltage	29.2 Vdc	28 Vdc	34 Vdc
ReFloat	25 Vdc	24 Vdc	26 Vdc
LBCO	21 Vdc	18 Vdc	24 Vdc
LBCI	25 Vdc	20 Vdc	28 Vdc
Absorb Time	1.0 hours	0.0 hours	24.0 hours
EQ Time	1.0 hours	0.0 hours	24.0 hours
Float Time	1.0 hours	0.0 hours	24.0 hours
Charger OFF/AUTO/ON	AUTO	N/A	N/A
Sell RE	26 Vdc	20 Vdc	30 Vdc
GenAlert & AUX			
GenAlert Off Set Point	28 Vdc	24 Vdc	36 Vdc
GenAlert On Set Point	22 Vdc	20 Vdc	28 Vdc
GenAlert On Delay	4 min	0 min	240 min
GenAlert Off Delay	9 min	0 min	240 min
AUX Output Option	COOL FAN	N/A	N/A
Set AUX Control	AUTO	N/A	N/A
Vent Fan Off Delay	5 min	0 min	30 min
Load Shed Off Set Point	22 Vdc	20 Vdc	28 Vdc
Vent Fan On Set Point	26 Vdc	20 Vdc	32 Vdc
Diversion On Set Point	29.2 Vdc	24 Vdc	32 Vdc
AC Output			
Set Vac	230 Vac	210 Vac	250 Vac
AC Transfer			
AC1/Grid Transfer Delay	6 AC cycles	0 AC cycles	240 AC cycles
Grid Lower Limit	208 Vac	140 Vac	220 Vac
Grid Upper Limit	252 Vac	250 Vac	280 Vac
AC2/Gen Transfer Delay	6 AC cycles	0 AC cycles	240 AC cycles
Gen Lower Limit	208 Vac	140 Vac	220 Vac
Gen Upper Limit	252 Vac	250 Vac	280 Vac
Stacking & Search			
Stacking Phase	Master	N/A	N/A
Search Threshold	6 watts	0 watts	50 watts
Search Pulses	8	4	20
Search Pulse Spacing	60 AC cycles	4 AC cycles	120 AC cycles
Charge Rates & Input			
Vented Model Charge Rate	9 Aac	0 Aac	10 Aac
Sealed Model Charge Rate	7 Aac	0 Aac	8 Aac
Grid Input Limit	30 Aac	2.5 Aac	30 Aac
Gen Input Limit	30 Aac	2.5 Aac	30 Aac
Input Select	Grid	N/A	N/A

48 Vdc System	DEFAULT	MINIMUM	MAXIMUM
Charger			
Float Voltage	54.4 Vdc	48 Vdc	600 Vdc
Absorb Voltage	57.6 Vdc	52 Vdc	64 Vdc
EQ Voltage	58.4 Vdc	56 Vdc	68 Vdc
ReFloat	50 Vdc	48 Vdc	52 Vdc
LBCO	42 Vdc	36 Vdc	48 Vdc
LBCI	50 Vdc	40 Vdc	56 Vdc
Absorb Time	1.0 hours	0.0 hours	24.0 hours
EQ Time	1.0 hours	0.0 hours	24.0 hours
Float Time	1.0 hours	0.0 hours	24.0 hours
Charger OFF/AUTO/ON	AUTO	N/A	N/A
Sell RE	52 Vdc	40 Vdc	60 Vdc
GenAlert & AUX			
GenAlert Off Set Point	56 Vdc	48 Vdc	72 Vdc
GenAlert On Set Point	44 Vdc	40 Vdc	56 Vdc
GenAlert On Delay	4 min	0 min	240 min
GenAlert Off Delay	9 min	0 min	240 min
AUX Output Option	COOL FAN	N/A	N/A
Set AUX Control	AUTO	N/A	N/A
Vent Fan OFF Delay	5 min	0 min	30 min
Load Shed Off Set Point	44 Vdc	40 Vdc	56 Vdc
Vent Fan On Set Point	52 Vdc	40 Vdc	64 Vdc
Diversion On Set Point	58.4 Vdc	48 Vdc	64 Vdc
AC Output			
Set Vac	230 Vac	210 Vac	250 Vac
AC Transfer			
AC1/Grid Transfer Delay	6 AC cycles	0 AC cycles	240 AC cycles
Grid Lower Limit	208 Vac	140 Vac	220 Vac
Grid Upper Limit	252 Vac	250 Vac	280 Vac
AC2/Gen Transfer Delay	6 AC cycles	0 AC cycles	240 AC cycles
Gen Lower Limit	208 Vac	140 Vac	220 Vac
Gen Upper Limit	252 Vac	250 Vac	280 Vac
Stacking & Search			
Stacking Phase	Master	N/A	N/A
Search Threshold	6 watts	0 watts	50 watts
Search Pulses	8	4	20
Search Pulse Spacing	60 AC cycles	4 AC cycles	120 AC cycles
Charge Rates & Input			
Vented Model Charge Rate	9 Aac	0 Aac	10 Aac
Sealed Model Charge Rate	7 Aac	0 Aac	8 Aac
Grid Input Limit	30 Aac	2.5 Aac	30 Aac
Gen Input Limit	30 Aac	2.5 Aac	30 Aac
Input Select	Grid	N/A	N/A

5-Year Limited Warranty for International Series GTFX and GVFX Inverter Products

OutBack Power Systems, Inc. ("OutBack") provides a five-year (5) limited warranty ("Warranty") against defects in materials and workmanship for its International Series GTFX and GVFX Inverter products ("Product").

The term of this Warranty begins on the Product(s) date of manufacture or the initial purchase date as indicated on the warranty registration card submitted to OutBack, whichever is later. This Warranty applies to the original OutBack Product purchaser, and is transferable only if the Product remains installed in the original use location. The warranty does not apply to any Product or Product part that has been modified or damaged by the following:

- Installation or Removal;
- Alteration or Disassembly;
- Normal Wear and Tear;
- Accident or Abuse;
- Corrosion;
- Lightning;
- Repair or service provided by an unauthorized repair facility;
- Operation contrary to manufacturer product instructions;
- Fire, Floods or Acts of God;
- Shipping or Transportation;
- Incidental or consequential damage caused by other components of the power system;
- Any product whose serial number has been altered, defaced or removed; or
- Any other event not foreseeable by OutBack.

OutBack's liability for any defective Product, or any Product part, shall be limited to the repair or replacement of the Product, at OutBack's discretion. OutBack does not warrant or guarantee workmanship performed by any person or firm installing its Products. This Warranty does not cover the costs of installation, removal, shipping (except as described below), or reinstallation of Products or parts of Products.

THIS LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY APPLICABLE TO OUTBACK PRODUCTS. OUTBACK EXPRESSLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTIES OF ITS PRODUCTS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. OUTBACK ALSO EXPRESSLY LIMITS ITS LIABILITY IN THE EVENT OF A PRODUCT DEFECT TO REPAIR OR REPLACEMENT IN ACCORDANCE WITH THE TERMS OF THIS LIMITED WARRANTY AND EXCLUDES ALL LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR LOST REVENUES OR PROFITS, EVEN IF IT IS MADE AWARE OF SUCH POTENTIAL DAMAGES. IF YOU ARE A CONSUMER THAT PURCHASED THIS PRODUCT IN A MEMBER STATE OF THE EUROPEAN UNION, YOU MAY HAVE ADDITIONAL STATUTORY RIGHTS UNDER DIRECTIVE 1999/44/EC. THESE RIGHTS MAY VARY FROM EU MEMBER STATE TO EU MEMBER STATE. SOME STATES (OR JURISDICTIONS) MAY NOT ALLOW THE EXCLUSION OR LIMITATION OF WARRANTIES OR DAMAGES, SO THE ABOVE EXCLUSIONS OR LIMITATIONS MAY NOT APPLY TO YOU.

How to Arrange for Warranty Service

During the warranty period beginning on the invoice date, OutBack Power Systems will repair or replace products covered under this limited warranty that are returned to OutBack Power Systems' facility or to an OutBack Power Systems authorized repair facility, or that are repaired on site by an OutBack Power Systems authorized repair person.

For full Warranty description, see previous page.

Contacting OutBack

To request warranty service, the customer must contact OutBack Technical Support at **+1.360.618.4363**, or **support@outbackpower.com**. To ensure warranty coverage, this contact must be within the effective warranty period. If service is required, the OutBack Technical Support representative will issue a Return Material Authorization (RMA) number.

Troubleshooting

In the event of a Product failure, the customer will need to work with an OutBack Technical Support representative to perform the necessary troubleshooting. This is a required step before a return can be performed. Internal troubleshooting requires a qualified technician to be present at the site of the Product, with a quality voltmeter that measures both DC and AC. The OutBack representative will request voltmeter readings, Product error messages, and other information. The vast majority of problems can be resolved on-site. If the customer does not provide these readings (or cannot visit the site), and the Product is found to have no problems upon return, OutBack may choose to charge additional labor and handling fees up to $180.00 USD.

Return Material Authorization (RMA)

A request for an RMA number requires all of the following information:

1. Product model and serial number;
2. Proof-of-purchase in the form of a copy of the original Product purchase invoice or receipt confirming the Product model number and serial number;
3. Description of the problem; and
4. Shipping address for the repaired or replacement equipment.

Upon receiving this information, the OutBack representative can issue an RMA number.

Returning Product to OutBack

After receiving the RMA number, the customer must pack the Product(s) authorized for return, along with a copy of the original purchase invoice and warranty certificate, in the original Product shipping container(s) or packaging providing equivalent or reasonable protection. The RMA number must be written on the outside of the packaging where it is clearly visible.

The Product(s) must be shipped back to OutBack Power Systems in their original or equivalent packaging, to the following address:

OutBack Power Systems

RMA # _____

6115 192nd Street NE

Arlington, WA 98223 USA

The customer must insure the shipment, or accept the risk of loss or damage during shipment. If a shipping box is needed for return of a Product, OutBack will, upon request, send a shipping box.

IMPORTANT: OutBack is not responsible for shipping damage caused by improperly packaged Products, the repairs this damage might require, or the costs of these repairs.

If, upon receipt of the Product, OutBack determines the Product or Product part is defective and that the defect is covered under the terms of this Warranty, OutBack will then, and only then, ship a repaired or replacement Product or Product part to the purchaser freight prepaid, non-expedited, using a carrier of OutBack's choice, where applicable.

If Product fails within ninety (90) days from original purchase date, OutBack will replace with a new Product. If Product fails after ninety (90) days and up to expiration of warranty, OutBack will, at its discretion, either repair and return a Product, or ship a replacement Product. OutBack will determine whether a Product is to be repaired or replaced in accordance with Product age and model. OutBack will authorize advance shipment of a replacement based on Product age and model.

In cases where an OutBack dealer or distributor replaces a Product more than ninety (90) days old with a new Product, OutBack will NOT compensate that dealer or distributor with new stock unless the exchange was authorized in advance by OutBack.

Out of Warranty

If Product is out of warranty, OutBack will repair and return Product for a fee. Alternately, if applicable, upon request, OutBack will advance-ship replacement parts for a fee.

If a shipping box is needed for return of out-of-warranty Product, OutBack will, upon request, send a shipping box. The customer is responsible for paying shipping to OutBack.

The warranty period of any repaired or replacement Product or Product part is ninety (90) days from the date of shipment from OutBack, or the remainder of the initial warranty term, whichever is greater.

This Warranty is void for any Product that has been modified by the customer without authorization by OutBack. A Product with a voided warranty will be treated the same as one with an expired warranty.

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